



Gelişmiş Telekomünikasyon Bilgi İşlem Mimarisi (ATCA) Tabanlı Veri Akışı ve Kontrol Sistemi İçin Boğaziçi Üniversitesi Kare Blok Laboratuvarı Tarafından Geliştirilen Bellenim Tasarım Çalışmaları

Parçacık Hızlandırıcıları ve Algıcıları Yerel
Altyapı ve Ar-Ge Çalıştayı

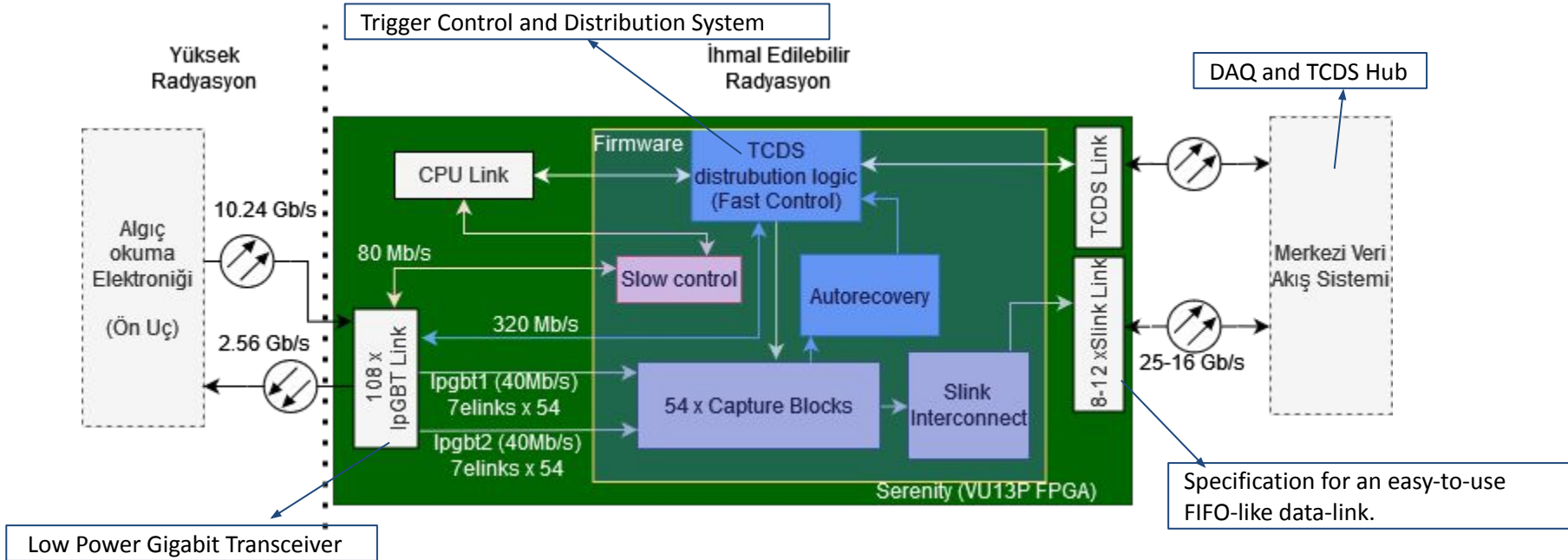
4 Aralık 2022

Mehmet Alp Şarkışla - Bora Akgün

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Veri Akışı ve Kontrol Sistemi (DAQ)

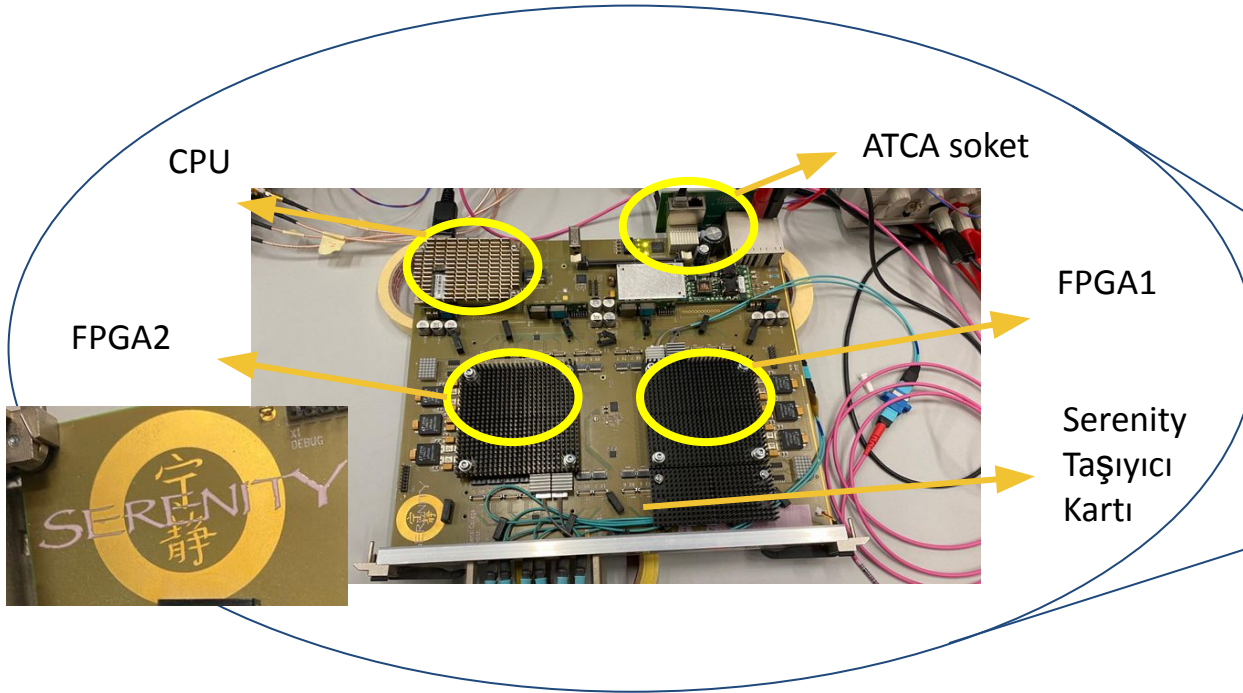
- Ön-uç bölgeden verinin işlenip merkezi veri akışı sistemine gönderilmesi
- Ön-uç bölge elektroniklerine gerekli komutların gönderilmesi (Hızlı Kontrol, 320Mb/s)
- Ön-uç bölge elektroniklerinin konfigüre ve monitör edilmesi (Yavaş Kontrol, 80Mb/s)



Serenity Taşıyıcı Kartı

14 Slotlu ATCA Rafı/Kasası

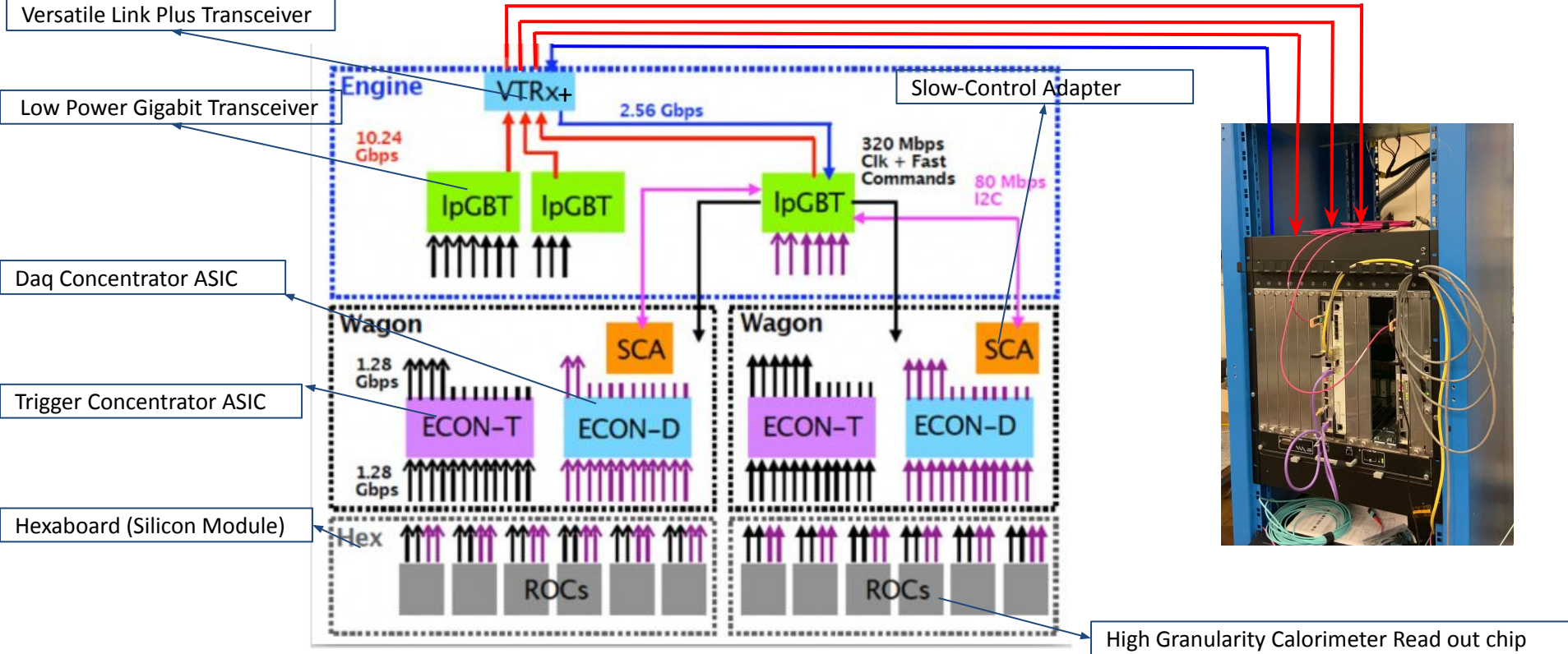
Advanced Telecommunications Computing Architecture (ATCA)
Gelişmiş Telekomünikasyon Bilgi İşlem Mimarisi



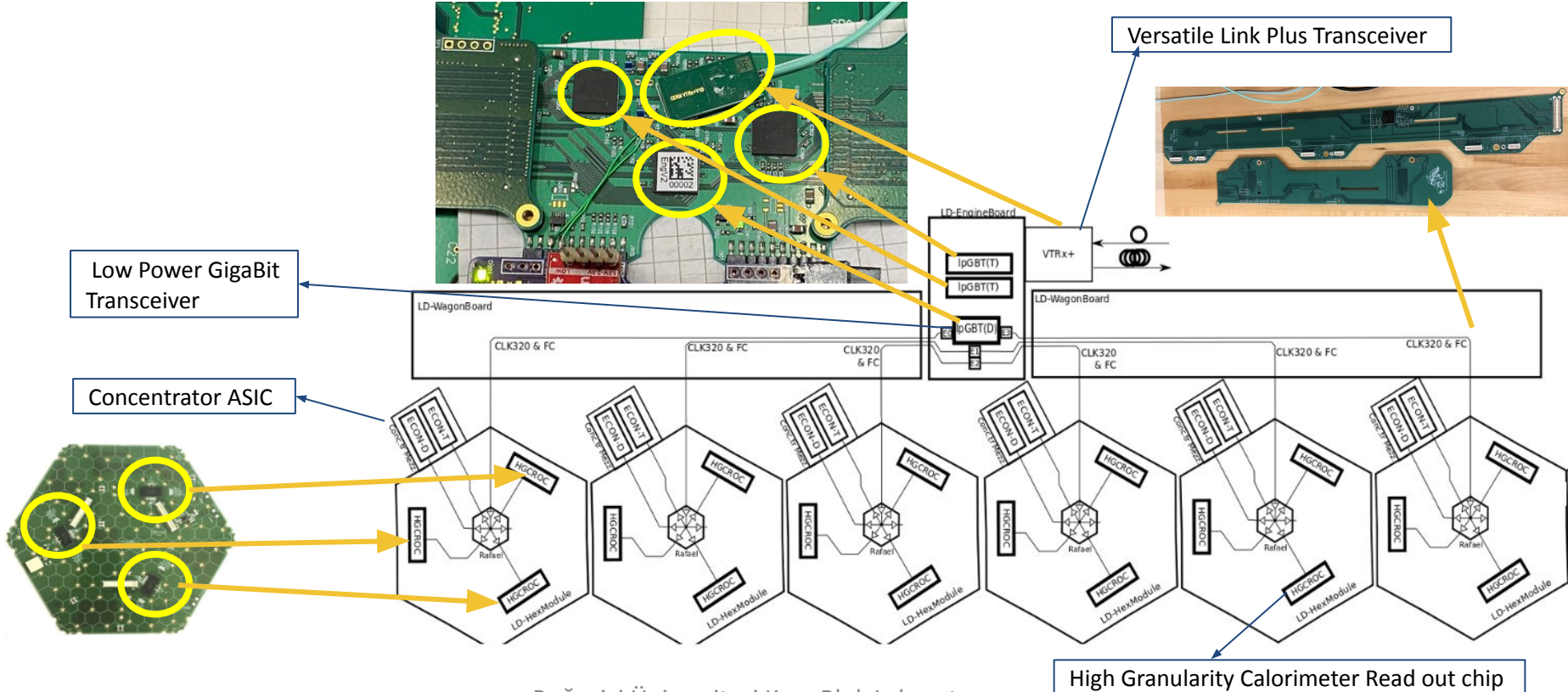


Ön-uç (Front-end) Bölge Elektronikleri

Ön-uç (Front-end) Bölge Elektronikleri Şematik



Ön-uç (Front-end) Bölge Elektronikleri Devre Kartları



Low Power GigaBit Transceiver

Versatile Link Plus Transceiver

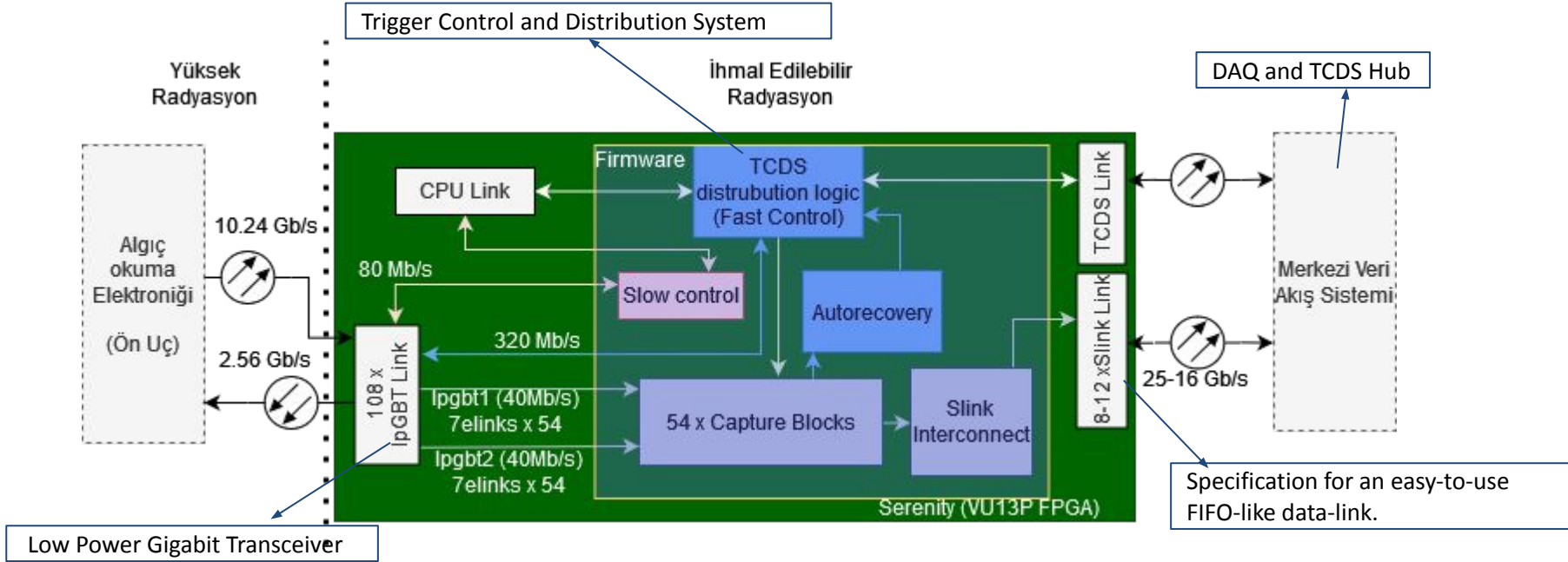
Concentrator ASIC

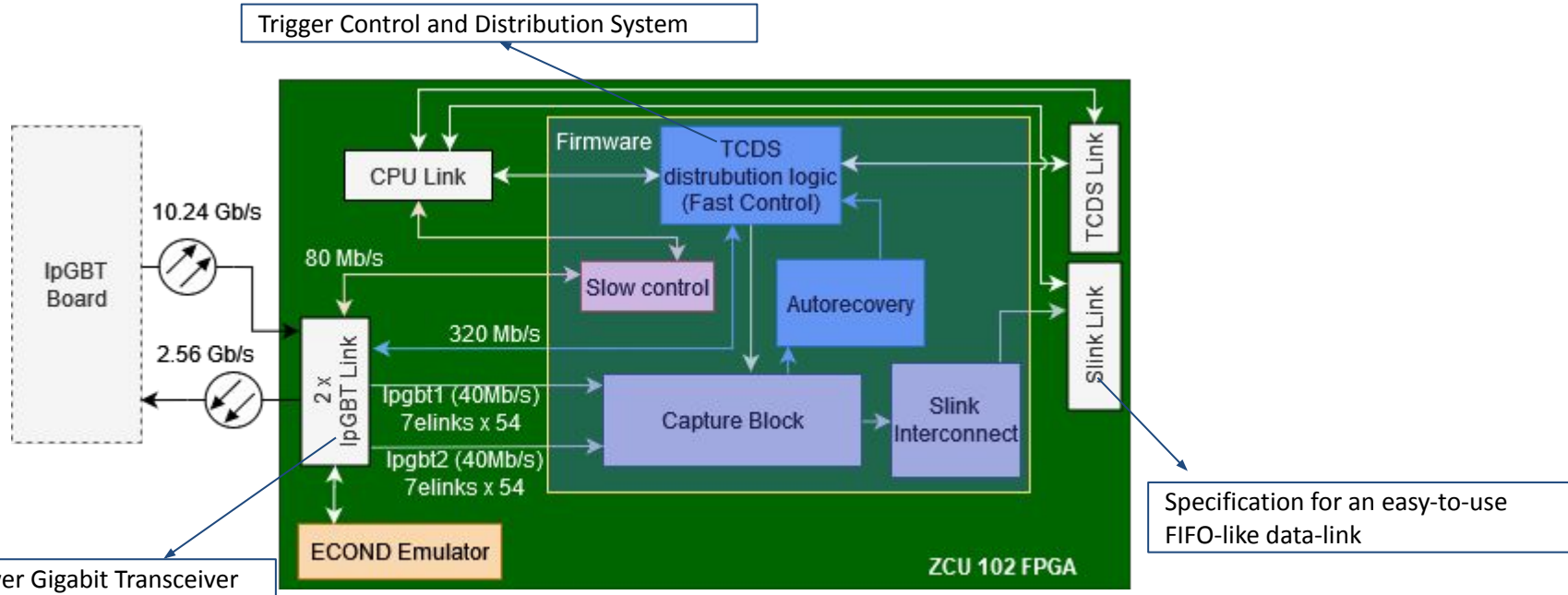
High Granularity Calorimeter Read out chip

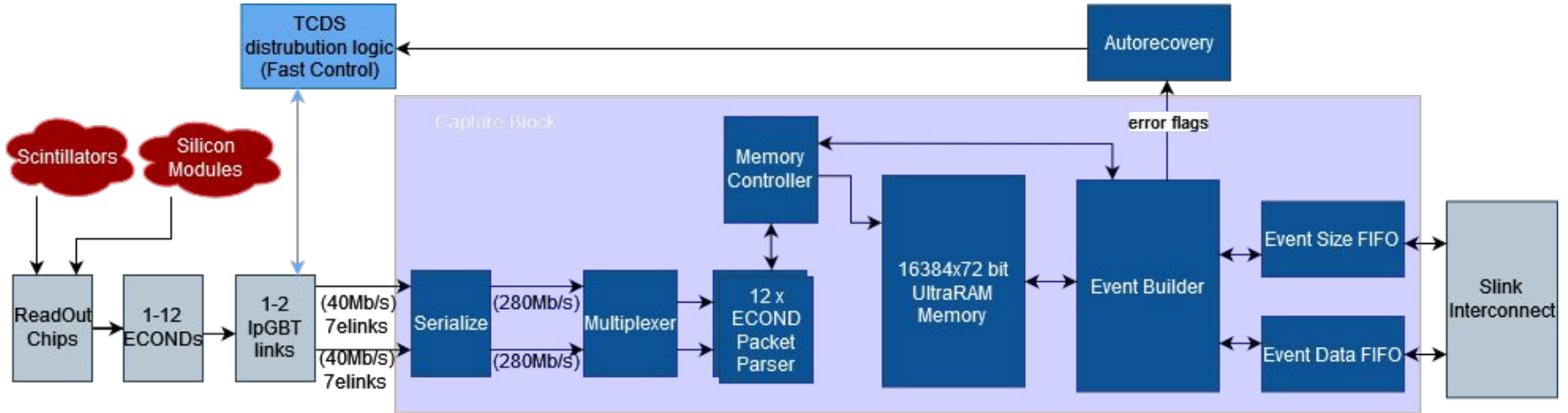


Veri Akışı ve Kontrol Sistemi Bellenim Tasarımı (DAQ & DAQ Firmware)

DAQ Son Sistemi







ECOND packet parser:

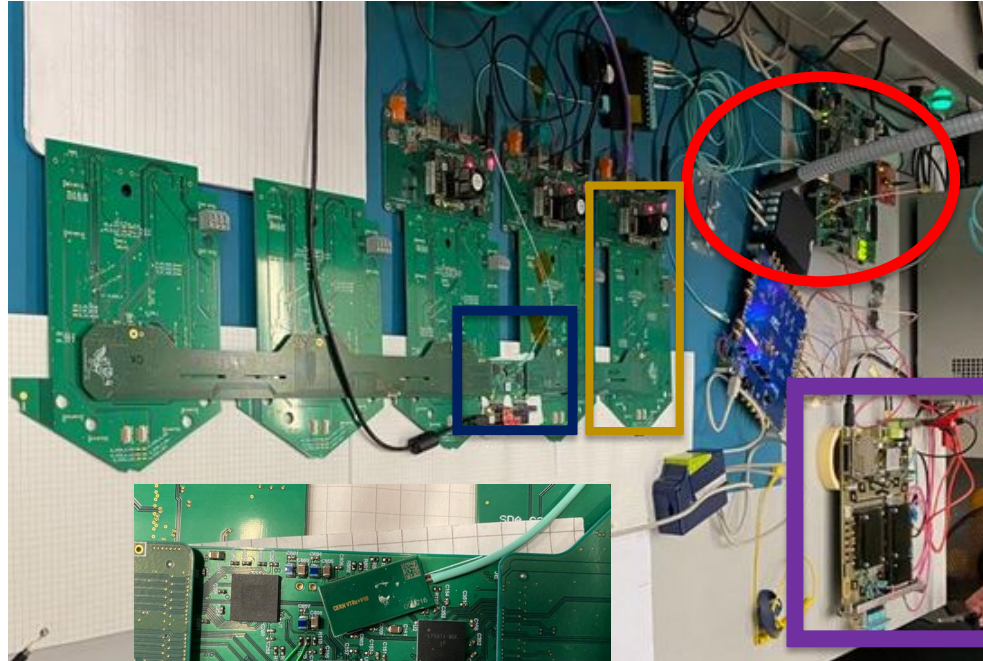
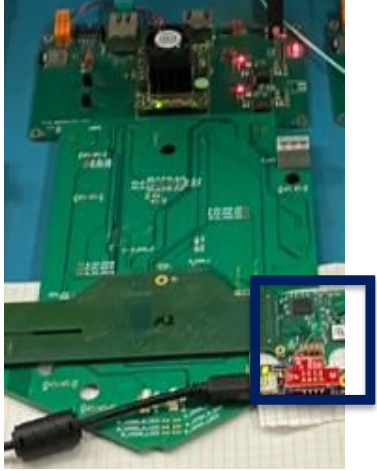
- **Hamming forward code correction**
- **CRC (Döngüsel artıklık denetimi)**
- **Başlık (Header) işaret kontrolü**
- **Bellek dolu?**

Event Builder:

- **Event ID Mismatch**
- **BunchCrossing ID Mismatch**

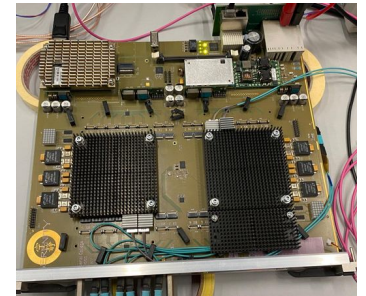
Veri Akışı ve Kontrol Sistemi Bellenim Test sistemi (DAQ Firmware)

DAQ Test Sistemi (Serenity)



ZCU102

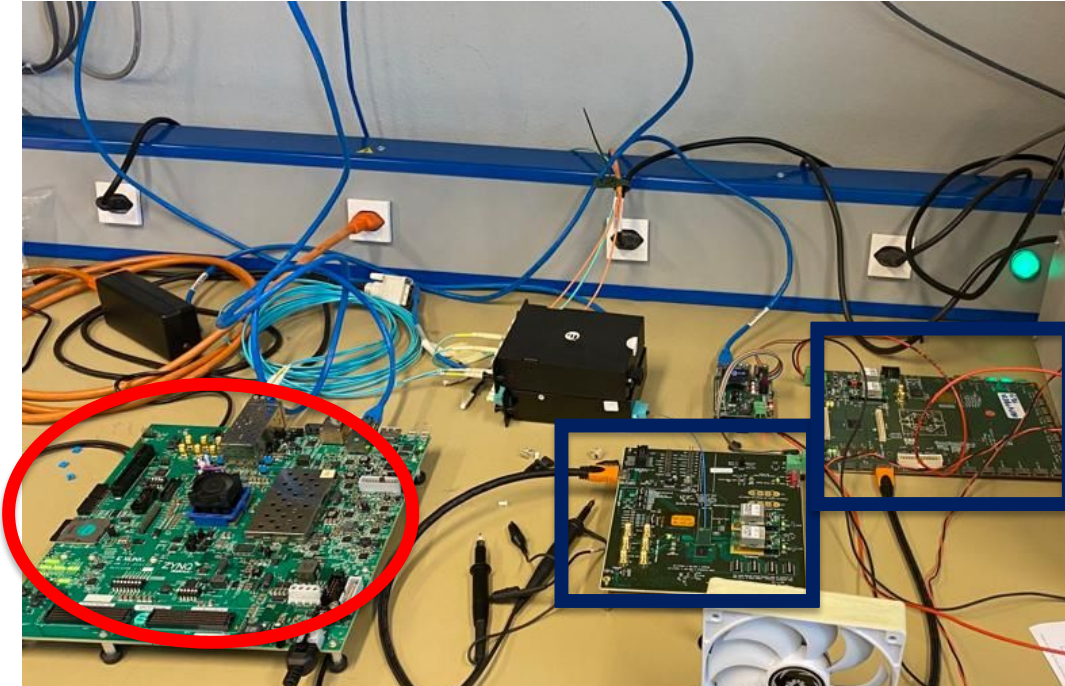
Serenity



ECOND Emulator

IpGBT board

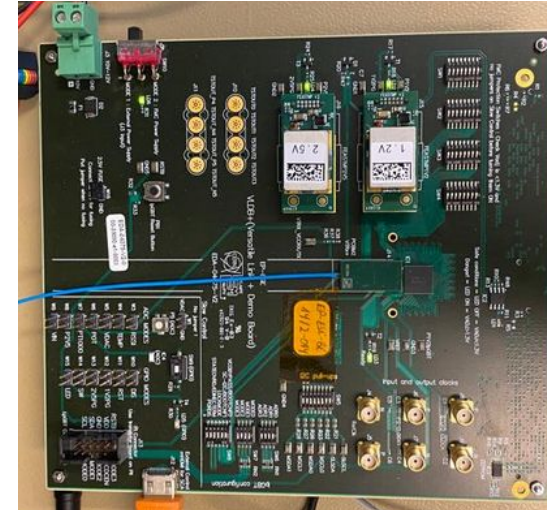
DAQ Test Sistemi (Slow Control)



ZCU102

IpGBT boards

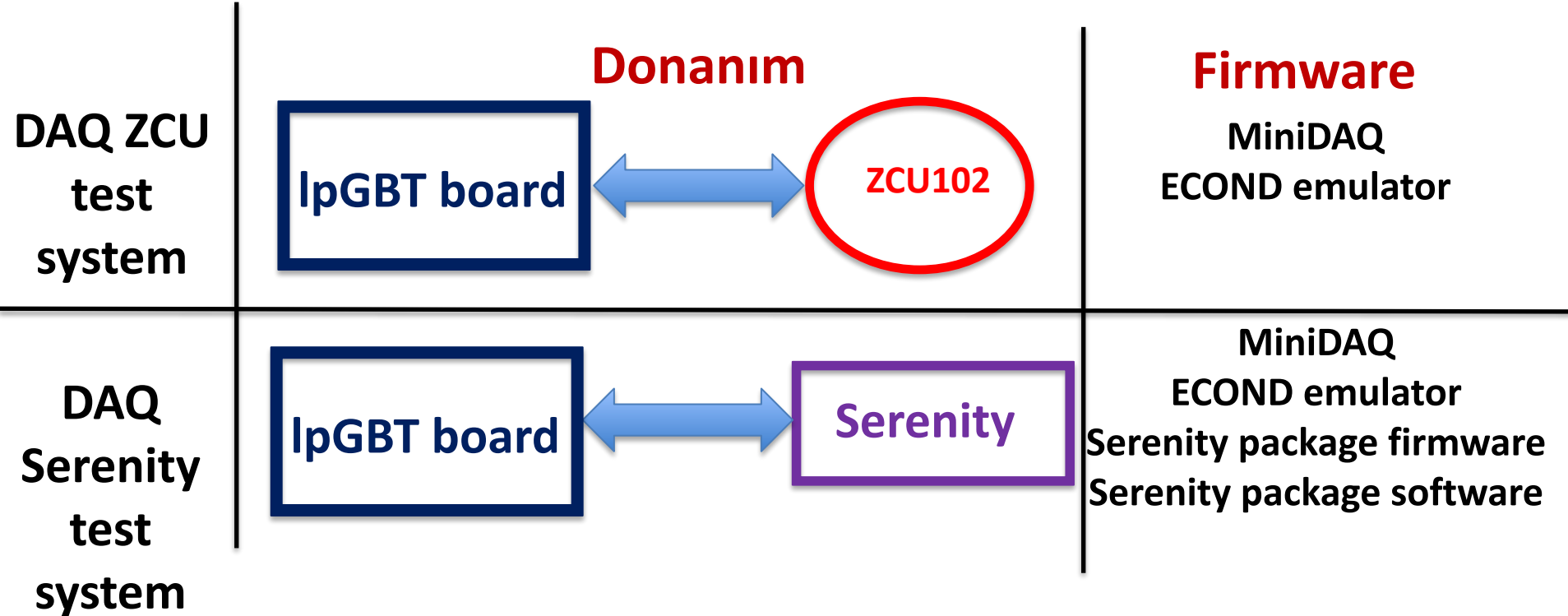
**IpGBT
boards**



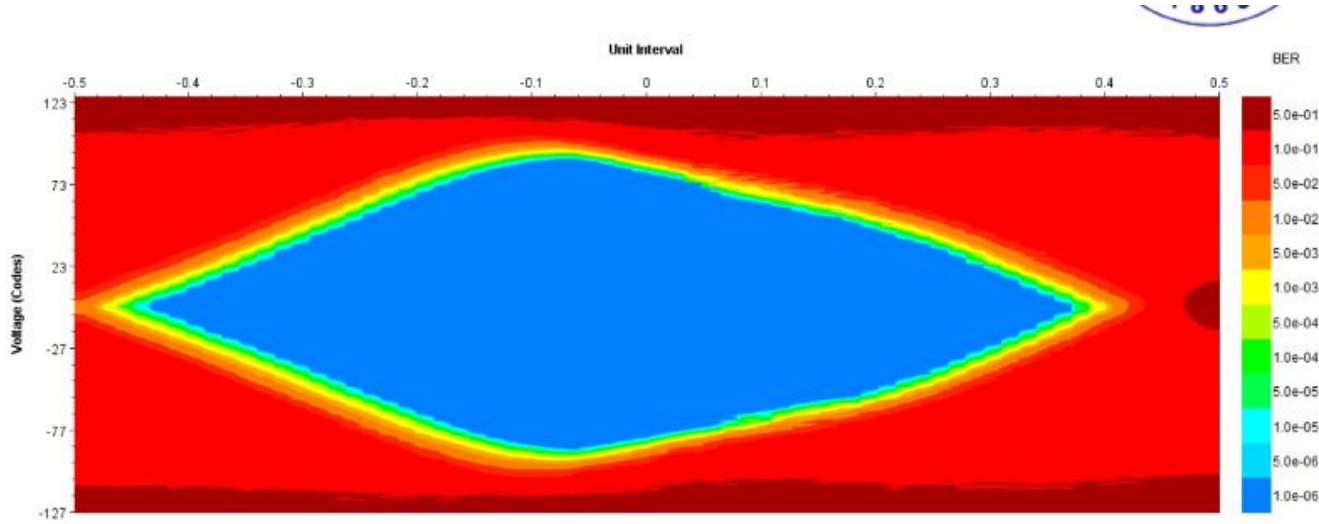
ZCU102



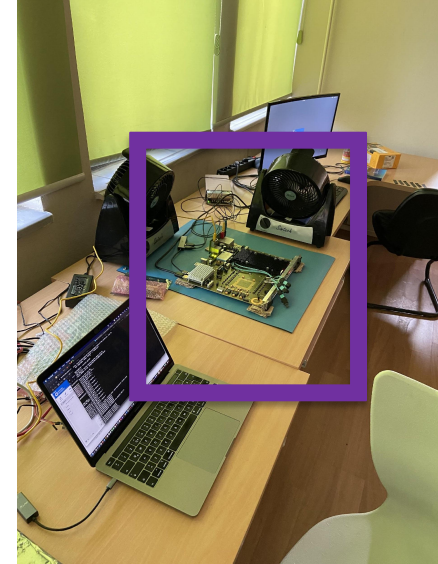
HGCAL DAQ ve Kontrol Geliştirme, Test ve Doğrulama



Serenity Optik Kanal ve Konnektör Testi (Göz)



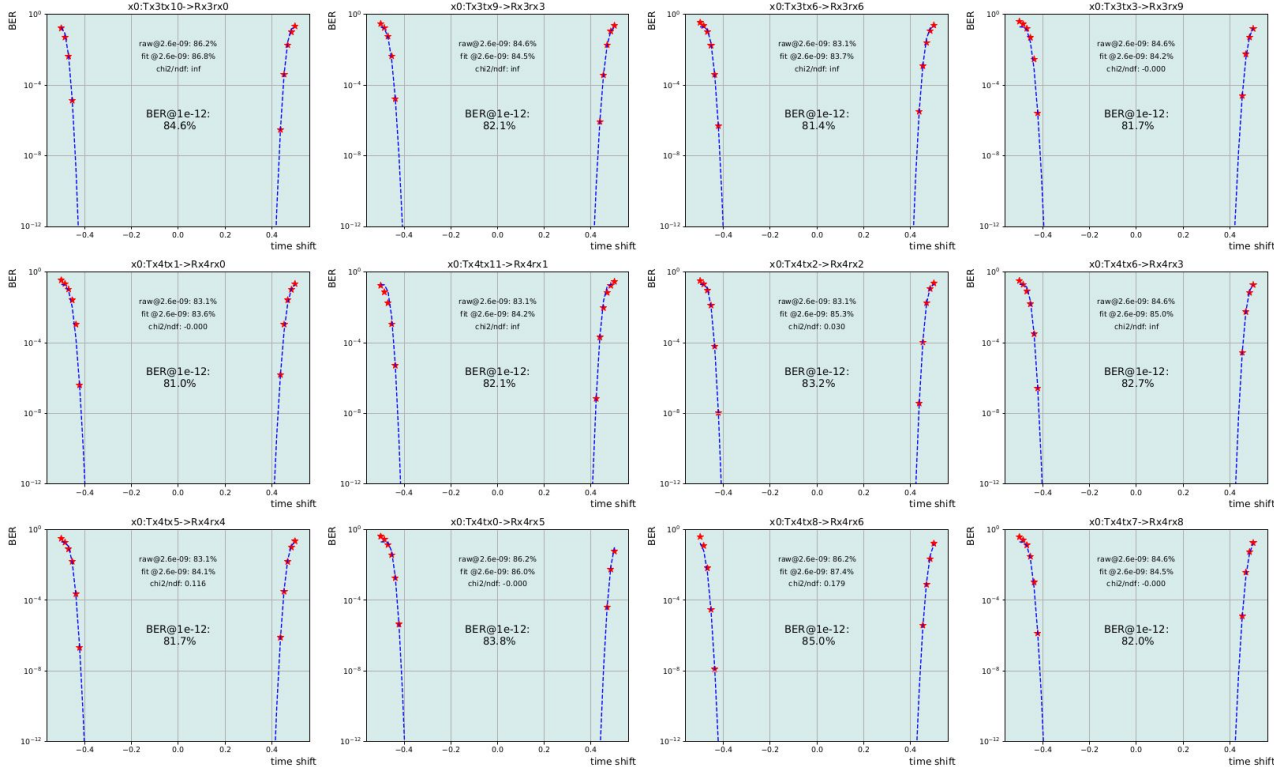
Integrated Bit-error Rate Test (IBERT)



Serenity

Serenity Optik Kanal ve Konnektör Testi (Göz)

KU15P so1.v1



- **Geliştirilen veri akışı ve kontrol bellenim tasarımının görevleri:**
 - **Yavaş Kontrol komutlarıyla ön-uç bölge elektroniklerinin konfigüre ve monitör edilmesi.**
 - **Hızlı Kontrol komutlarıyla ön-uç bölge elektroniklerine gerekli komutların gönderilmesi.**
 - **Ön-uç bölgeden verinin işlenip merkezi veri akışı sistemine gönderilmesi.**
 - **Gelen veriden kaynaklı hataların çözümlenebiliyorsa çözümlenip, merkezi veri sisteminin bilgilendirilmesi.**
- **Tasarımın farklı versiyonları farklı tip (ZCU ve Serenity) ve sayıda donanım üzerinde test edilip 2027'den itibaren asıl algıçın veri akış ve kontrol sisteminde kullanılacak.**
- **Benzer donanım ve bellenim tasarımları farklı çalışmalarımızda da kullanmayı planlıyoruz.**



KareBlokLab

Dinlediğiniz İçin Teşekkürler :)

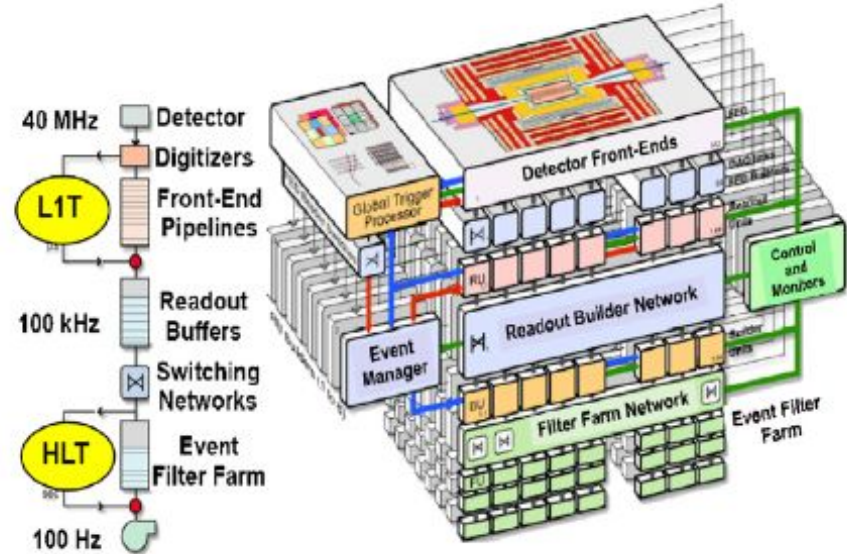


KareBlokLab

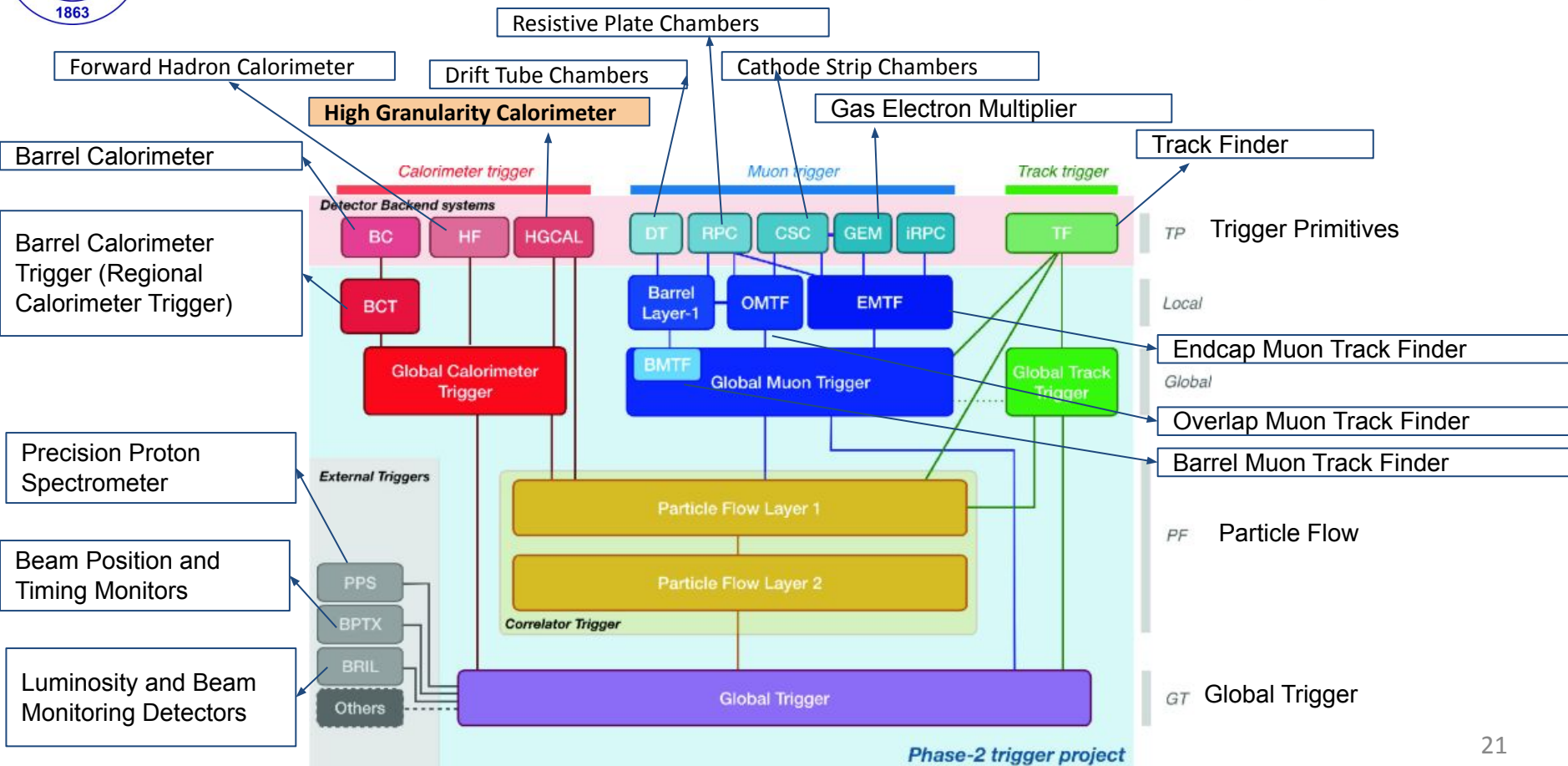
BACKUP

Trigger System

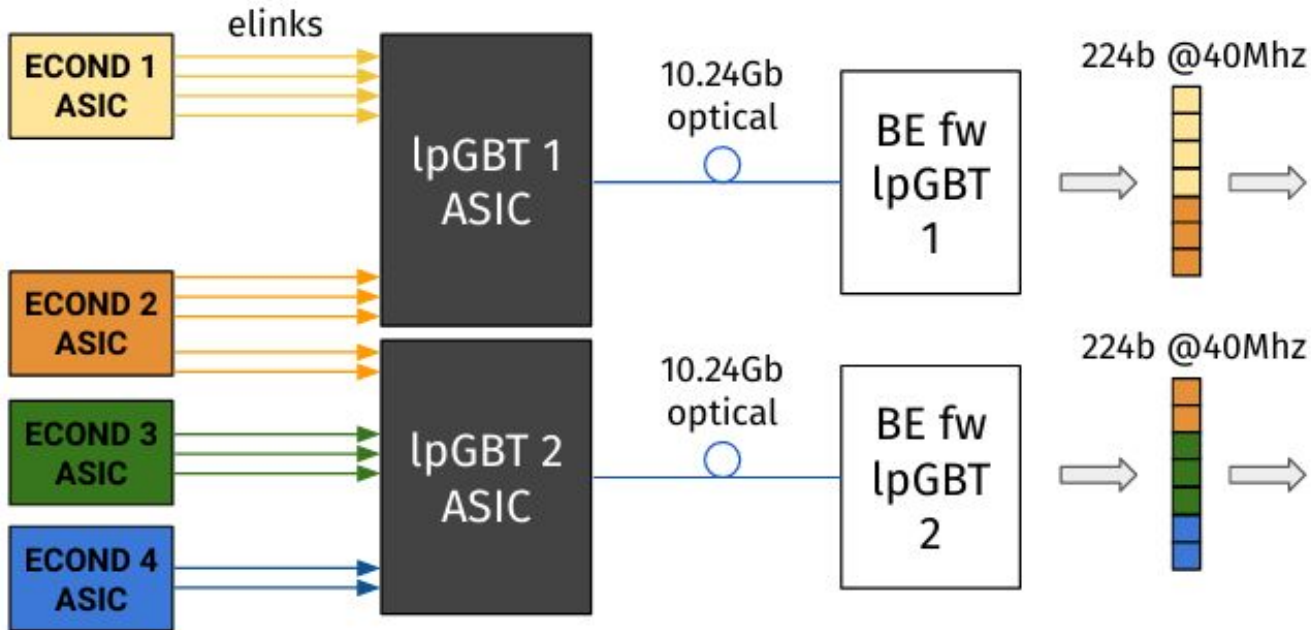
- 1 collision every 25 nanoseconds
- 40 million collisions in a second
- Initial selection
- Ultra fast
- Chooses which data is important



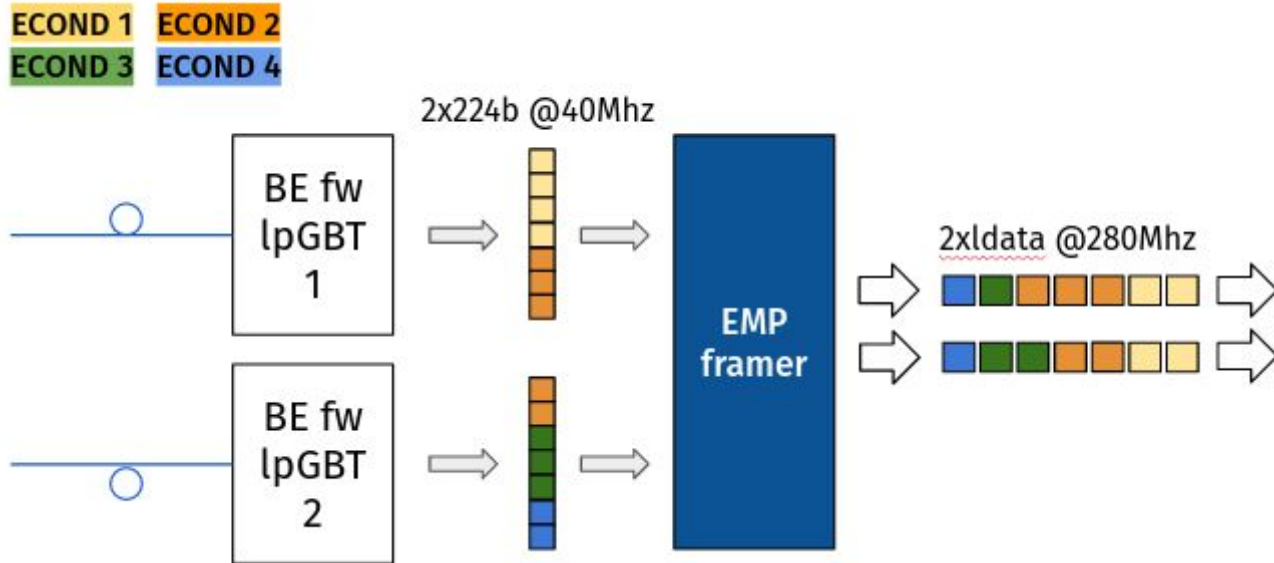
Phase-2 Level-1 Trigger System



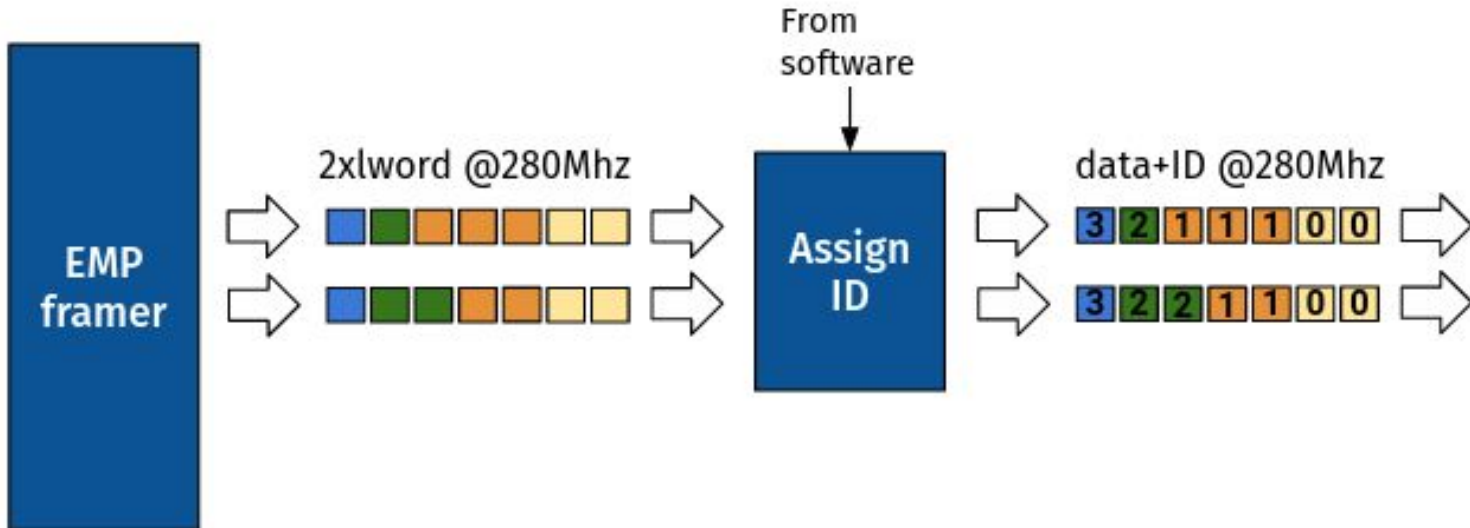
FrontEnd-BackEnd transition



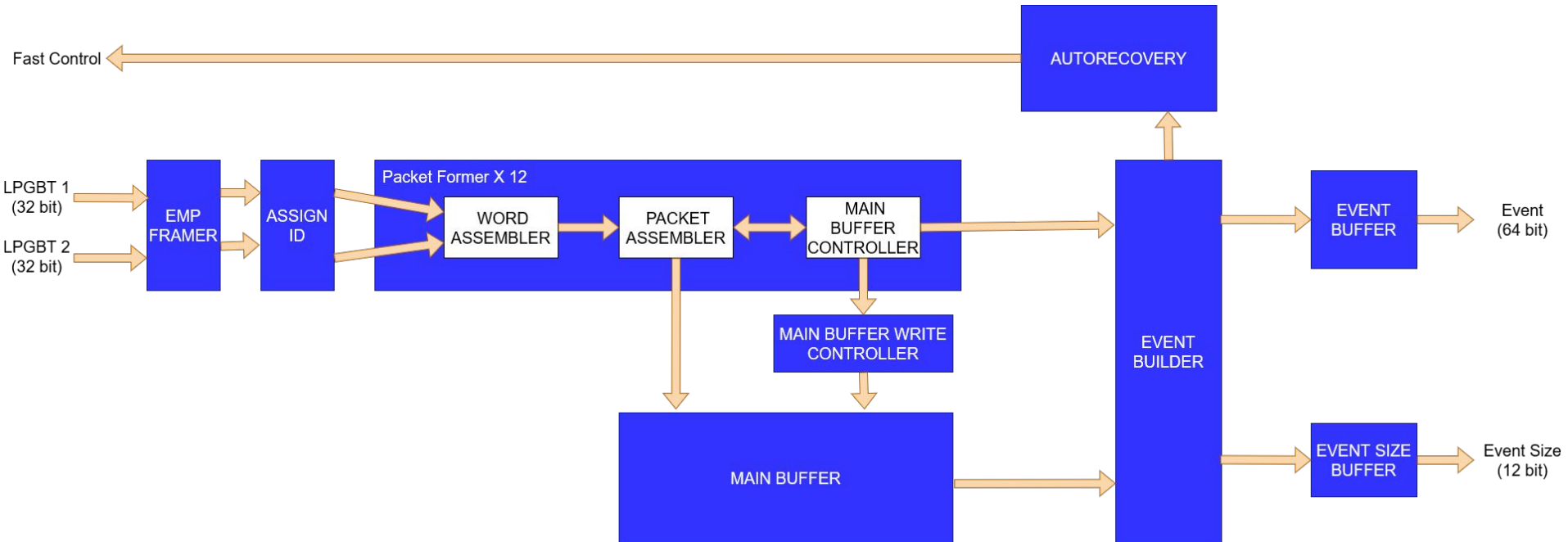
Serialize



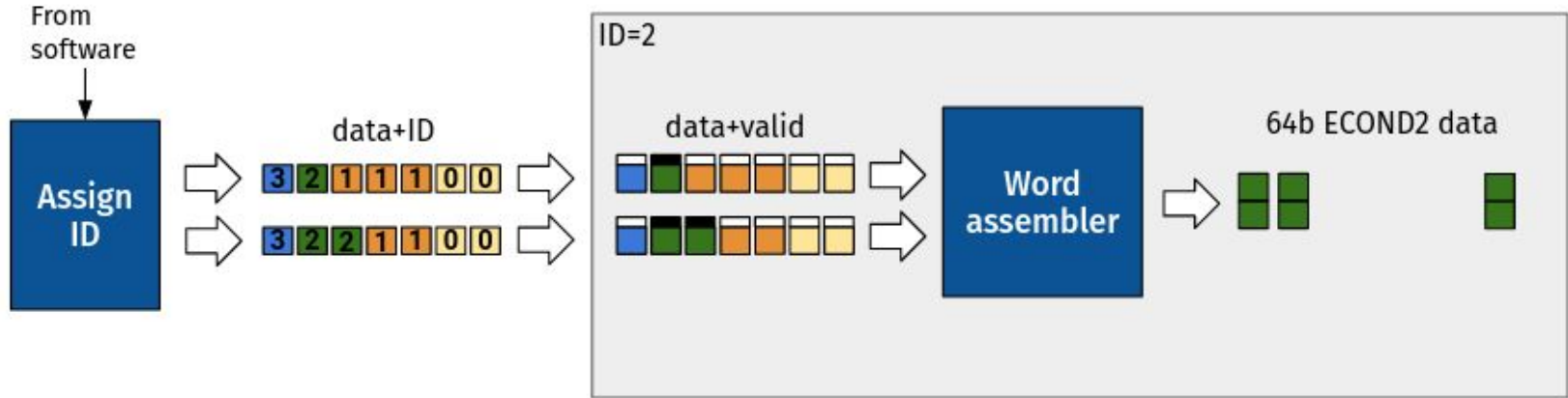
ID Assign



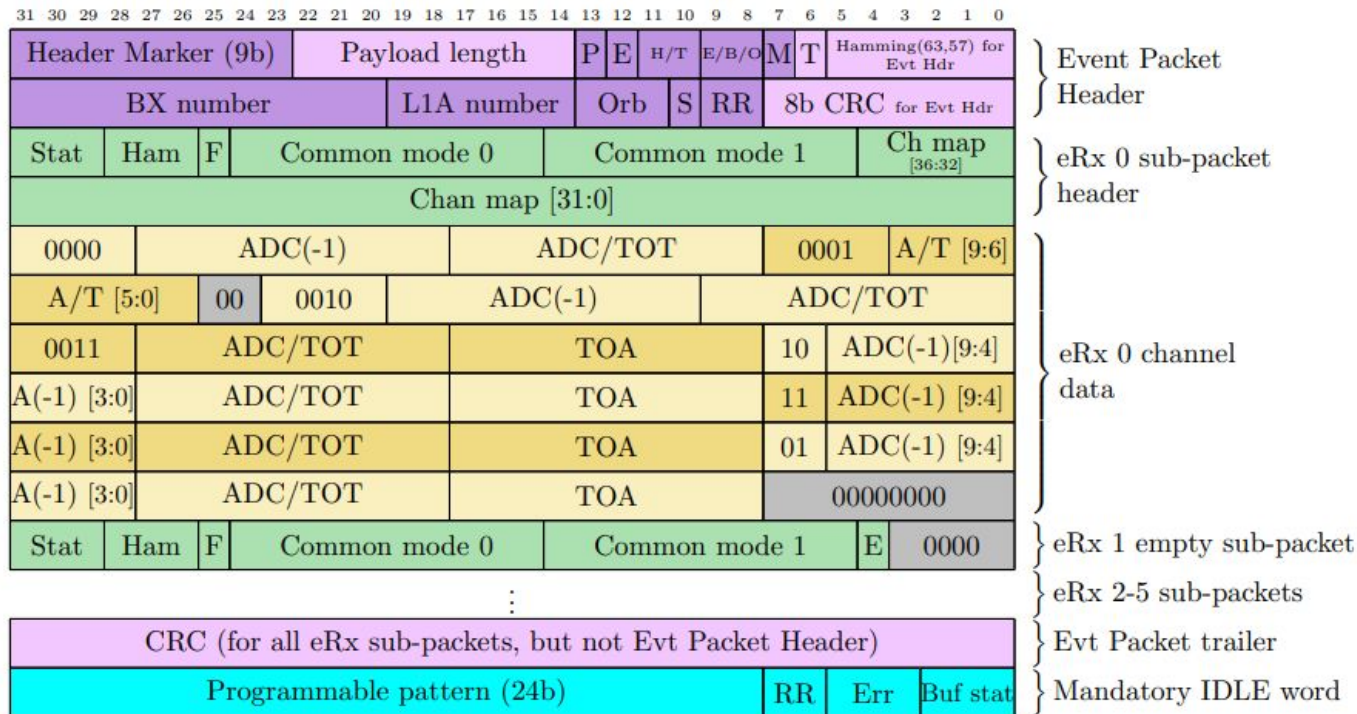
Capture Block



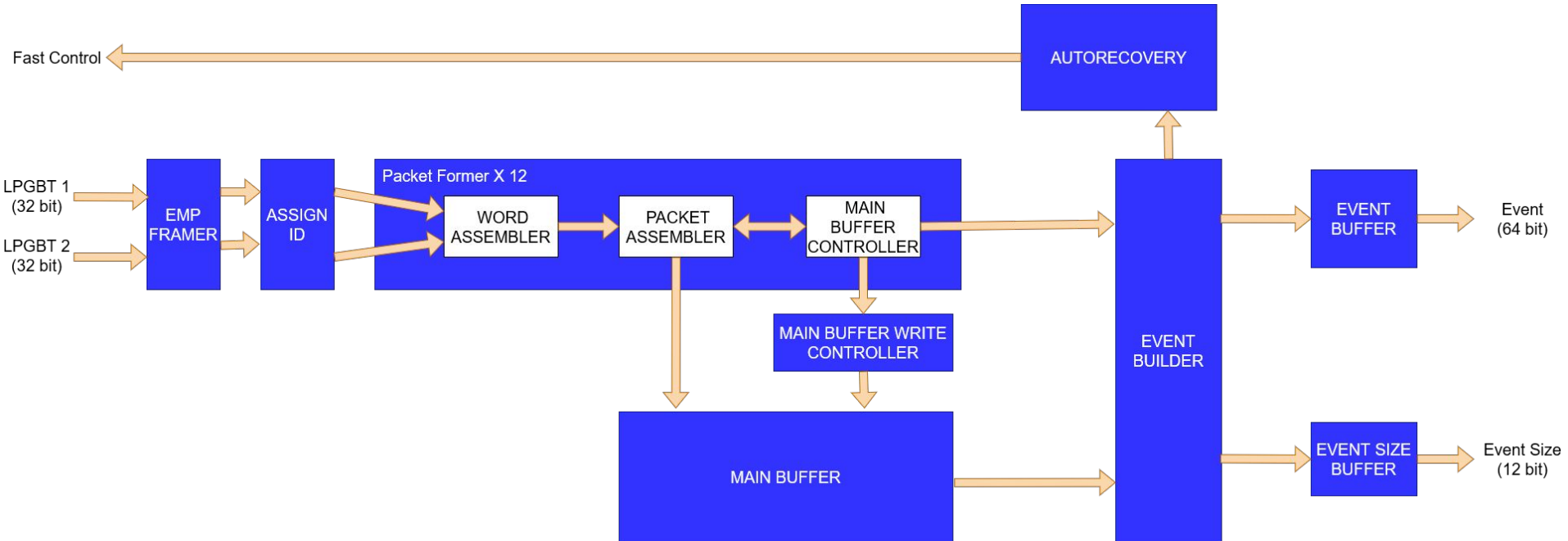
Word Assembler



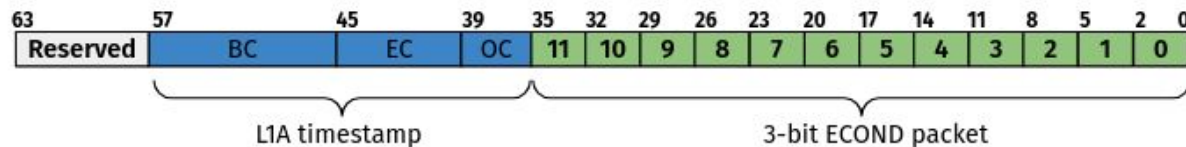
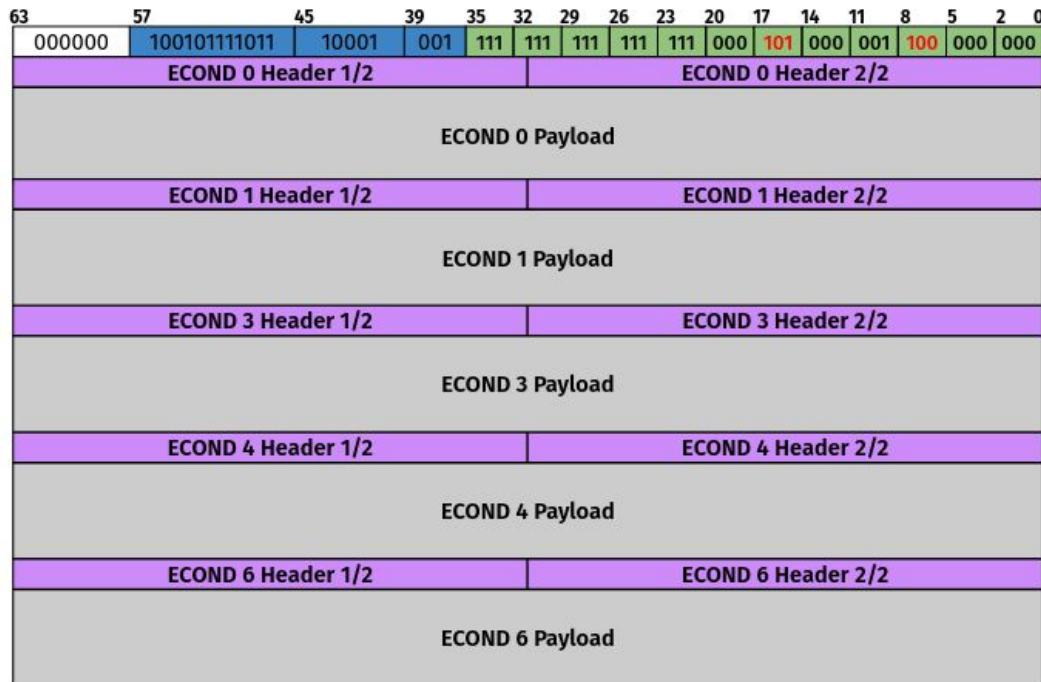
Packet Assembler



Main Buffer



Event Builder



Event Builder Description

Code	Description
000	Normal packet.
001	Packet with payload CRC error (not implemented yet).
010	Packet with EventID mismatch.
011	Reserved.
100	No <u>ECOND</u> packet. The event builder state machine timed-out.
101	No <u>ECOND</u> packet due to BCID and/or OrbitID mismatch.
110	No <u>ECOND</u> packet. Packet was detected but was discarded due to Main Buffer overflow.
111	Inactive/Unconnected <u>ECOND</u> input.

Autorecovery

